CLAIMS

What is claimed is:

1. In a method for determining a fracture pressure gradient of a subsurface region of earth formations comprising:

(a) obtaining seismic survey information about the subsurface region;

(b) identifying a plurality of interpreted seismic horizons of interest from the obtained survey information;

(c) obtaining estimated seismic velocities corresponding to at least one interval between at least one pair of said plurality of seismic horizons;

(d) calibrating the estimated seismic velocities to the parameter of interest

(e) using the results of said calibration and the obtained seismic velocities to obtain said fracture pressure gradient at any location within the seismic survey;

an improvement comprising:

(i) deleting erroneous leak-off test values for at least one well;

(ii) displaying depth-correlated leak-off test and overburden data for the at least one well, and

(iii) applying one of the three following methods

I. curve fitting of the leak off test data from one or more offset control wells to determine a fracture gradient,

II. determining a percentage of the overburden stress that honors the available regional data, and

III. applying an appropriate stress ratio (Ko) to fit the leak-off test data

2. In a method for determining a fracture pressure gradient of a subsurface region of earth formations comprising:

(a) obtaining seismic survey information about the subsurface region;

(b) identifying a plurality of interpreted seismic horizons of interest from the obtained survey information;

(c) obtaining estimated seismic velocities corresponding to at least one interval between at least one pair of said plurality of seismic horizons;

(d) calibrating the estimated seismic velocities to the parameter of interest

(e) using the results of said calibration and the obtained seismic velocities to obtain said fracture pressure gradient at any location within the seismic survey;

an improvement comprising displaying the parameter of interest on one of:

(i) P- or S-wave velocity displays;

(ii) P-wave impedance displays;

(iii) S-wave impedance displays;

(iv) P-wave frequency attribute displays;

(v) S-wave frequency attribute displays;

(vi) P-wave phase attribute displays;

(vii) S-wave phase attribute displays;

(viii) density displays;

(ix) P-wave amplitude attribute displays;

(x) S-wave amplitude attribute displays.

3. In a method for determining a fracture pressure gradient of a subsurface region of earth formations comprising:

(a) obtaining seismic survey information about the subsurface region;

(b) identifying a plurality of interpreted seismic horizons of interest from the obtained survey information;

(c) obtaining estimated seismic velocities corresponding to at least one interval between at least one pair of said plurality of seismic horizons;

(d) calibrating the estimated seismic velocities to the parameter of interest

(e) using the results of said calibration and the obtained seismic velocities to obtain said fracture pressure gradient at any location within the seismic survey;

an improvement comprising calibrating the estimated seismic velocities by at least one of:

(i) deleting or correcting for zones of abnormal velocity caused by the presence of hydrocarbon fluids;

(ii) deleting zones of abnormal velocity caused by the presence of non-clastic rocks;

(iii) deleting zone of secondary pressure or correcting for zones of secondary pressure through the determination of an unloading exponent, and

(iv) deleting or correcting for centroid effects in structured porous formations.

4. In a method for determining a fracture pressure gradient of a subsurface region of

earth formations comprising:

(a) obtaining seismic survey information about the subsurface region;

(b) identifying a plurality of interpreted seismic horizons of interest from the obtained survey information;

(c) obtaining estimated seismic velocities corresponding to at least one interval between at least one pair of said plurality of seismic horizons;

(d) calibrating the estimated seismic velocities to the parameter of interest

(e) using the results of said calibration and the obtained seismic velocities to obtain said fracture pressure gradient at any location within the seismic survey;

an improvement comprising displaying the parameter of interest interactively and simultaneously on at least one of:

(i) a seismic display

(ii) a velocity versus depth display including a velocity function for a specific location and a predicted normal velocity trend based on a calibration function for velocity versus effective stress,

(iii) a stress versus depth display including the calculated overburden stress for said specific location and the effective stress calculated from the velocity versus depth display,

(iv) a pressure-gradient versus depth display including the fracture gradient or overburden gradient, the fluid pressure gradient calculated from the stress versus depth display, and pressure data points from a well that applies to said specific location.